

# Numerical Simulation Comparison of Two Valved Holding Chambers for the Treatment of Respiratory Diseases <sup>†</sup>

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**Abstract:** Valved Holding Chambers (VHC) are medical devices that improve the efficiency of inhalation therapy when metered-dose inhalers are used. Few works in the literature study the internal flow of these devices. In this work, a local market VHC (A) and a reference VHC (B) are simulated and compared. Both devices are cylindrical but have different valve designs. For this purpose, a computational fluid dynamics (CFD) model was applied, using ANSYS FLUENT 19.0 software, to simulate the particle and fluid motion and predict drug transport and deposition. The results show that particles are deposited in the valve area and that chamber A retains 16% less of the incoming particles than B. This is due to the area reduction, and fluid recirculation is smaller in A than in B. In addition, the particle velocity at the outlet of B is 33% lower, which could decrease the oropharyngeal impact of the particles. However, the respirable fraction (1-5 microns) is higher than 70% in both VHC, which is an indicator of the good performance of these devices for inhalable drug delivery. It is concluded that the model is suitable for studying the processes involved in particle deposition in the VHC.

**Keywords:** VHC; computational fluid dynamics; particle deposition.

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## Conflicts of Interest

The authors declare no conflict of interest.